UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Plasma Physics Laboratory

2223-1-F1701Q131

Aims

Acquisition of experimental skills and techniques in plasma physics

Contents

The course consists of a series of experiments on microwaves, vacuum, laboratory plasmas and magnetised plasmas. The experiments will be preceded by a series of introductory lectures on the physics and diagnostics of plasmas, vacuum and microwaves.

Detailed program

The course includes a series of introductory lectures on plasma physics and diagnostics, vacuum and microwaves (12 hours).

The laboratory exercises (108 hours) involve carrying out experiments on the following topics:

a) Microwave propagation in waveguides. Characterisation of a microwave antenna.

b) Setting up a vacuum chamber. Characterisation of the vacuum using mass spectroscopy and search for leaks.

c) Production of a plasma by means of an electric discharge in a low-pressure gas. Study of the effect of a static magnetic field on the plasma.

d) Study of the propagation of low-frequency waves in the plasma.

e) Production of atmospheric pressure plasmas for biomedical applications.

f) Characterisation of plasma using Langmuir probes and optical spectroscopy.

g) Study of plasma density fluctuations using different techniques (electrostatic probe array, fast imaging).and advanced data analysis techniques.

Prerequisites

none

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 2022.

The laboratory activities will be held partly in room 2025 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 Ruggero Barni, U2 building, third floor, room 3029, email: ruggero.barni@unimib.it
prof. Emilio Martines, U2 building, third floor, room 3026, email: emilio.martines@unimib.it

Sustainable Development Goals

QUALITY EDUCATION | GENDER EQUALITY | INDUSTRY, INNOVATION AND INFRASTRUCTURE