INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	: **PLASMA DIAGNOSTICS**
TRANSLATION	: DIAGNOSTICOS EN PLASMAS
NUMBER	: FIM4007
CREDITS	: 15 UC / 9 SCT
MODULES	: 2 PER WEEK
REQUISITES	: FIZ2700
CONECTOR	: AND
RESTRICTIONS	: 030401, 030501
CHARACTER	: OPTATIVE
FORMAT	: THEORETICAL LECTURES
QUALIFICATION	: STANDARD
FORMATIVE LEVEL	: DOCTORATE
DISCIPLINE	: PHYSICS

I. COURSE DESCRIPTION

This course provides contents and advanced tools in plasma physics, emphasizing different experimental diagnostic techniques. These techniques will be useful in different research lines of plasma physics and related areas. At the end of the course, the student will be able to dominate the physical basis of plasma diagnostic techniques for measuring temperature, density, magnetic fields, neutron emission amongst others.

II. LEARNING OUTCOMES

- To dominate the physical basis related to plasma diagnostic techniques, including measurement ranges and limitations of each technique
- To be able to critically analyze the proper use of different plasma diagnostics in use on different experiments.
- To make a decision on which plasma diagnostic technique is more appropriate for measuring different physical quantities on a given experiment.

III. CONTENTS

1. Laser Diagnostics
    a. Interferometry, schlieren y shadowgraphy
    b. Faraday rotation
    c. Laser scattering

2. Neutron detection

3. Plasma spectroscopy
    a. Considerations for plasma in local thermodynamical equilibrium (LTE) and non-LTE
    b. Spectrometers
    c. Intensity ratios and line broadening

4. Electrical diagnostics in plasmas and pulsed power
    a. Photons detectors on different energy ranges (diodes, PCD, bolometers, etc)
    b. Characteristics and operation modes of detectors (MCP, streak camera, photomultipliers, etc)
    c. Electrical diagnostics and pulsed power.

5. Probes.

a. Langmuir probes
b. Magnetic probes
c. Particles detection (Faraday probes, Thomson parabola, etc)

IV. METHODOLOGICAL STRATEGIES

- Theoretical lectures.
- Reading and/or analysis of scientific papers.
- Presentations/reports from students.

V. EVALUATIVE STRATEGIES

- Tests and/or homeworks
- Presentations.

VI. BIBLIOGRAPHY

REQUIRED

- H. Griem, Principle of Plasma spectroscopy, Cambridge (1997).
- H-J Kunze, Introduction to Plasma Spectroscopy, Springer (2009).
- R. Huddlestone & S. Leonard, Plasma Diagnostic techniques, Academic press (1965).
- I. H. Hutchinson, Principles of Plasma Diagnostics, Cambridge (1987).
- M. A. Lieberman & A. J. Lichtenberg, Principles of Plasma Discharges and Materials Processing, Wiley (2005).
- Papers published in different scientific journals (such as Phys Rev Lett, Phys Plasmas, Rev Sci Instrum, amongst many others)

OPTIONAL

N/A