



INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	:	EXPERIMENTAL METHODS IN CONDENSED MATTER AND MATERIAL PHYSICS
TRANSLATION	:	MÉTODOS EXPERIMENTALES DE FÍSICA DE MATERIA CONDENSADA Y DE MATERIALES
NUMBER	:	FIM3500
CREDITS	:	15 UC / 9 STC
MODULES	:	3
REQUISITES	:	FIS1542, FIZ0311, FIZ1450
CONECTOR	:	OR
RESTRICTIONS	:	030401, 030501
CHARACTER	:	OPTATIVE
FORMAT	:	THEORETICAL LECTURES
QUALIFICATION	:	STANDARD
FORMATIVE LEVEL	:	DOCTORATE
DISCIPLINE	:	MATERIAL SCIENCES AND NANOTECHNOLOGY

I. COURSE DESCRIPTION

This course is aimed at graduate students. In this course there will be a presentation of selected experimental methods of Condensed Matter Physics (Solid Physics / Soft Matter Physics / Surface Physics / Materials Science and BioNanoTechnology).

II. LEARNING OUTCOMES

1. Familiarize the student with advanced experimental methods that are part of the international tools collection of researchers in the aforementioned areas.
2. Transmit technical knowledge relevant to the endeavor in the research, application and production sectors.
3. Strengthen the skills of exposure and participation in seminars on scientific and technological topics.

III. CONTENT

1. Vacuum techniques (vacuum generation, materials, seals, measurement).
2. Methods of low-temperature physics (challenges for measurements of properties of condensed matter at low temperatures, generation of low temperatures, He4 cryostats, H3-H4 mixtures, liquid nitrogen, insulation, materials, temperature measurement) .
3. Transmission electron microscope (TEM).
4. Scanning electron microscope (SEM / FE-SEM).
5. Tunneling microscope (STM).
6. Scanning Probe Microscope (AFM / MFM / PFM / SNOM).
7. STED microscopy.
8. Spectroscopic methods (Monochromators, UV-VIS).
9. Methods of polarization and phase of visible light.
10. Magnetic methods (MOKE, NanoMoKE).
11. Particle Beam Methods (LEED, Ion Beam).
12. X-ray diffraction, X-ray images.
13. Neutron Diffraction (generation of n, applications of n).
14. Raman spectroscopy.
15. Auger spectroscopy.
16. Specific topic (s), according to the needs for the development of a Master's or Doctorate thesis.



IV. METHODOLOGICAL STRATEGIES

Lecture classes, works in groups of three or more, exhibitions per postgraduate student.

Literature search (books and publications that are not part of the bibliography list).

V. EVALUATIVE STRATEGIES

- Three tests or homeworks. (30%)
- Three or more presentations / exhibitions for each student. (40%)
- A final oral exam that covers in depth the subject / topics of the entire semester (obligatory). (30%)

VI. BIBLIOGRAPHY

REQUIRED

- Bhushan, B. Springer Handbook of Nanotechnology, 2da. Edición, Berlin, 2007.
- Cohen, S.H., Lightbody, M.L. Atomic Force Microscopy/Scanning Tunneling Microscopy 2. Ed. I, vol. 1, Springer, 1997.
- Cohen, S.H., Lightbody, M.L. Atomic Force Microscopy/Scanning Tunneling Microscopy 3. N.Y. ,Kluwer Academic, 1999.
- Egerton, R.F. Physical Principles of Electron Microscopy : An Introduction to TEM, SEM, and AEM , N.York , Springer, 2005.
- Suryanarayana,C., Norton, M. G. X-Ray Diffraction: A Practical Approach. N.York Plenum Press, 1998.
- Tompkins, H.G., Irene, E.A. Handbook of Ellipsometry. Norwich, N.York. William Andrew Pub. 2005
- Trigg, G.L. Encyclopedia of Applied Physics. Weinheim, Wiley-VCH Berlin. 2004.

The Vacuum Technology Book, Pfeiffer Vacuum (disponible en pdf).

OPTIONAL

N/A