



INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	:	CURRENT TOPICS IN CONDENSED MATTER
TRANSLATION	:	TÓPICOS ACTUALES DE FÍSICA DE LA MATERIA CONDENSADA
NUMBER	:	FIM4014
CREDITS	:	15 UC / 9 SCT
REQUISITES	:	FIZ3600, FIZ0322
CONECTOR	:	AND
RESTRICTIONS	:	30501
CHARACTER	:	OPTATIVE
FORMAT	:	THEORETICAL LECTURES
QUALIFICATION	:	STANDARD
FORMATIVE LEVEL	:	DOCTORATE
DISCIPLINE	:	PHYSICS

I. COURSE DESCRIPTION

This course is carried out in a seminar-type format, it provides knowledge about empirical phenomenology and the theoretical description of various research topics in Condensed Matter. At the end of the course, students will be able to learn the use of basic computational simulation tools, analytical quantum calculus and experimental techniques for characterizing nano-materials, applicable in research in Condensed Matter.

II. LEARNING OUTCOMES

1. Know and understand the empirical phenomenology and the theoretical description of various research topics in Condensed Matter.
2. Mastering the use of basic computational simulation tools, analytical quantum calculus and experimental techniques for the characterization of nano-materials.

III. CONTENT

1. Low dimensional materials:
 - a. Clusters.
 - b. Carbon nanotubes.
 - c. Graphene and graphene tapes.
2. First principles calculations (ab-initio).
3. Magnetic materials.
4. Ferroelectric materials.
5. Chemical reactions on surfaces.
6. Molecular dynamics.
7. Atomic force microscopy.
8. Electron spectrometry.
9. Transport in Nanostructures:
 - a. Green's function method.
 - b. Kondo effect.
 - c. Fano and Dicke effect.
10. Strongly correlated systems.
11. Quantum Points.
12. Ultracold Gases:
 - a. Bose-Einstein condensation.
 - b. Strong interactions.
 - c. BCS-BEC transition.

IV. METHODOLOGICAL STRATEGIES

Oral presentations with discussion.
Reading paper.
Informal discussions with students.



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V. EVALUATIVE STRATEGIES

Assistance 100%.

VI. BIBLIOGRAPHY

MINIMUM

Publications of the following indexed journals:

Nature
Science
Nature Materials
Nature Nanotechnology
Physical Review Letters
Physical Review B
Nanotechnology
Applied Physics Letters

OPTIONAL

N/A