INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	:	**ADVANCED SOLID STATE PHYSICS**
TRANSLATION	:	FÍSICA DEL SÓLIDO AVANZADA
NUMBER	:	FIM3405
CREDITS	:	15 UC / 9 SCT
MODULES	:	2
REQUISITES	:	FIZ0322, FIZ0411, FIZ0412, FIZ3600
CONECTOR	:	AND
RESTRICTIONS	:	030401,030501
CHARACTER	:	OPTATIVE
FORMAT	:	THEORETICAL LECTURES
QUALIFICATION	:	STANDARD
FORMATIVE LEVEL	:	DOCTORATE
KEY WORD	:	Ferromagnetism, Quantum Hall Effect, Topological Insulators, Superconductivity.
DISCIPLINE	:	PHYSICS

I. COURSE DESCRIPTION

The course covers various advanced topics of Solid Physics in contemporary research topics. At the end of the course, students will be able to know and apply the knowledge acquired in contemporary research topics in the area of condensed matter. The course will be evaluated based on assignments and expository seminars.

II. LEARNING OUTCOMES

Students will
1. Know and understand advanced topics of Solid Physics in contemporary research topics,
2. Analyze the principles and applications in research in magnetism in solids and their properties;
3. Apply topology concepts to theoretical models of topological insulators and Weyl semimetals in condensed matter.

III. CONTENT

1. Magnetism in Solids
2. Spin waves in ferro and antiferromagnetic materials.
3. Spin currents
4. Quantum Hall effect and topology. Introduction.
5. Topological and semimetal insulators.
6. Microscopic theory of superconductivity.

IV. METHODOLOGICAL STRATEGIES

Lecture classes
Homework
Seminars

V. EVALUATIVE STRATEGIES

Homework : 70%
Seminars : 30%

VI. BIBLIOGRAPHY

REQUIRED

- Girvin, Steven M., and Kun Yang. Modern condensed matter physics. Cambridge University Press, 2019.
- Simon, Steven H. The Oxford solid state basics. OUP Oxford, 2013.
- Ashcroft, N. W., N. D. Mermin, and D. Wei. Solid State Physics, revised ed. Cengage Learning, Singapore (2016).
- Vanderbilt, David. Berry Phases in Electronic Structure Theory: Electric Polarization, Orbital Magnetization and Topological Insulators. Cambridge University Press, 2018.
- SHUN-QING. SHEN. Topological Insulators: Dirac Equation in Condensed Matter. Springer, 2018.

OPTIONAL

N/A
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