INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	:	**SEMICONDUCTOR DEVICE TECHNOLOGY**
TRANSLATION	:	TECNOLOGÍA DE LOS DISPOSITIVOS SEMICONDUCTORES
NUMBER	:	FIM4017
CREDITS	:	15 UC / 9 SCT
MODULES	:	2
REQUISITES	:	FIS1533, FIZ0311, MAT1532
CONECTOR	:	OR
RESTRICTIONS	.	030401, 030501
CHARACTER	:	OPTATIVE
FORMAT	:	THEORETICAL LECTURES
QUALIFICATION	:	STANDARD
KEY WORD	:	DEVICES, SEMICONDUCTORS, MICRO / NANOTECHNOLOGIES
FORMATIVE LEVEL	:	DOCTORATE
DISCIPLINE	:	PHYSICS, ENGINEERING

I. COURSE DESCRIPTION

This course is intended to introduce the important physical concepts of semiconductor devices and integrated circuits, with an emphasis on micro and nanofabrication technologies. The course begins by addressing the bases of semiconductors: the growth of semiconductors, their purification, doping, their physical properties, among others. Then the basics of the most common electronic devices are introduced: bipolar transistor, field effect transistor (FET) and junction (JFET). Finally, the course addresses in depth the technologies and manufacturing tools (Clean Room, diffusion, ion implantation, metallization, lithography and engraving) of common micro and nano-devices found in modern electronic applications as well as the technological challenges of the microelectronics industry. . Recent advances are also introduced in the research of new materials and semiconductor nanostructures for advanced devices.

II. LEARNING OUTCOMES

- Understanding of semiconductor devices, both from the point of view of the physics of semiconductor materials and the more technological point of view of nano-manufacturing of integrated circuits.
- Identify and describe the operation of a semiconductor device and understand the stages of device manufacturing found in modern scientific literature.

III. CONTENT

1. Introduction to Semiconductors

1.1. Semiconductor Materials and their Manufacture

1.2. Electronic Properties and Transport Equations

2. Semiconductor Devices

2.1. Information Processing History

2.2. Structures, Principles and Models

2.3. Integrated circuits

2.4. Downscaling: Moore and the New Paradigms

3. Clean Rooms and Laboratories

3.1. Air Filtration

3.2. Clean room Principles and Operation

3.3. Industrial Examples

4. Technological Micro-Manufacturing Processes

4.1. Lithography: Optical, Electronic

4.2. Deposition and Corrosion Techniques

4.3.Equipment available in UC Physical Clean Room

4.4. Packaging

IV. MATHODOLOGICAL STRATEGIES

- Lecture: The lecture presents the theory and important concepts of semiconductor devices (see content).

- Project-based methodology Teamwork

-Report made in pairs, about a current research topic (to be defined at the beginning of the course).

- Individual presentations of a recent publication.

V. EVALUATIVE STRATEGIES

The evaluation will be carried out by means of a test on the theoretical content of the chair, a report and an individual presentation on a defined topic at the beginning of the class.

- 40% tests

- Written report 30%

- Presentation 30%

VI. BIBLIOGRAPHY

Required:

C. Kittel, *Introducción to Solid State Physics*, 7th or 8th edition, Wiley. ISBN 978-0-471-41526-8.

G.S. May and S.M. Sze, *Fundamentals of Semiconductor Fabrication*, Wiley. ISBN 0-471-23279-3.

J. H. Davies, *The Physics of Low-dimensional Semiconductors: An Introduction*, Cambridge University Press. ISBN-13 9780521484916

Optional:

S.M. Sze, M.-K. Lee, *Semiconductor Devices: Physics and Technology*, Wiley. ISBN 978-0470537947.

S. Dimitrijev, *Principles of Semiconductor Devices*. ISBN: 9780195388039.