26928 - Physical Electronics

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	447 - Degree in Physics
ECTS	6.0
Year	4
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

Considering the general objectives of the course, the learning process designed for this course is based on the acquisition of theoretical knowledge, problem solving and realization of the experimental part, according to the following scheduled activities:

*Participative lectures addressed to the entire group of students, plus individual or in small groups care tutorial for activity 1 (4 ECTS).

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* Problem-based learning and team and individual work for Activity 2 (1 ECTS) *Laboratory work and reports for activity 3 (1 ECTS)
*Theoretical-practical works performed individually for activity 4

5.2.Learning tasks

1:

Classroom lectures comprising the development and discussion of the content of the course, based on the notes and bibliography supplied by the teacher. It consists of 40 1-hour sessions and 40 hours of personal work of the student.

Chapter 1: Crystalline solids.
Chapter 2: The electron distribution in semiconductors. Chapter 3: Nonhomogeneous semiconductors.
Chapter 4: The pn junction.
Chapter 5: The pn junction diode.
Chapter 6: Enhancement-mode MOSFET (EMOS). Chapter 7: Other field effect transistors.
Chapter 8: FET transistors: Applications.
Chapter 9: Bipolar Junction Transistor.
Chapter 10: BJT in the active region.

2:

Problem solving and analysis of case studies related to the contents of the subject. It consists of 10 classroom hours with the broadest possible interaction between teacher and
students, and involves 10 hours of personal work.

3:

Laboratory sessions: observation, experimental characterization and measurement of semiconductor devices. This Activity will be conducted in four sessions of two hours and a half. This means 10 classroom hours and 20 hours of personal work for the preparation of reports containing relevant results and conclusions.

4:

Theoretical-practical works, proposed by the teacher throughout the semester and that the student must complete individually, counting with specific follow-up tutorials. The evaluation will be included in the section of continuous assessment. The dedication of the student is equivalent to 20 hours.

5.3.Syllabus

Chapter 1: Crystalline solids.
Chapter 2: The electron distribution in semiconductors. Chapter 3: Nonhomogeneous semiconductors.
Chapter 4: The pn junction.
Chapter 5: The pn junction diode.
Chapter 6: Enhancement-mode MOSFET (EMOS). Chapter 7: Other field effect transistors.
Chapter 8: FET transistors: Applications.
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5.4.Course planning and calendar

The theoretical contents and the problems will be conducted according to the thematic sections listed above.
The experimental part consists of 4 sessions of 2 1⁄2 hours duration each one:

1. Experimental characterization of the diode and extraction of its characteristic parameters.
2. Special diodes.
3. MOS transistors: Static characteristic and transfer functions.
4. BJT transistors: Models and applications.

Lectures and problems will be taught in the classroom and schedule established by the Dean. The laboratory calendar will be set according to the number of students, the development of the course and the availability of laboratories.

5.5.Bibliography and recommended resources

- BB Anderson, Betty Lise. Fundamentals of semiconductor devices / Betty Lise Anderson, Richard L. Anderson Boston [etc.] : McGraw-Hill, cop. 2005
- BB Kano, Kanaan. Semiconductor devices / Kanaan Kano New Jersey : Prentice-Hall International, cop. 1998
- BB Neamen, Donald A.. Semiconductor physics and devices : basic principles . 4th McGraw-Hill, cop. 2012
- BC Albella Martín, José María. Fundamentos de microelectrónica, nanoelectrónica y fotónica / José María Albella, José Manuel Martínez-Duart , Fernando Agulló-Rueda Madrid : Pearson Educación, D.L. 2005
- BC Dimitrijev, Sima. Understanding semiconductor devices / by Sima Dimitrijev New York : Oxford University Press, 2000
- BC Jaeger ,R.. Microelectronics Circuit Design. McGraw-Hill, 2015
- BC Jaeger, Richard C.. Microelectronic circuit design / Richard C. Jaeger, Travis N. Blalock . - International ed. Boston [etc.] : MacGraw-Hill, 2008
- BC Julián, Pedro. Dispositivos semiconductores : principios y modelos / Pedro Julián . Barcelona : Alfaomega : Marcombo, 2015
- BC Mishra, Umesh K.. Semiconductor device physics and design / by Umesh K. Mishra, Jasprit Singh Dordrecht : Springer, cop. 2008
- BC Neamen, Donald A.. An introduction to semiconductor devices / Donald A. Neamen Boston [etc.] : McGraw-Hill Higer Education, cop. 2006
- BC Pierret, Robert F.. Semiconductor device fundamentals / Robert F. Pierret Reading [etc.] : Addison-Wesley, cop. 1996
- BC Sedra, A.. Microelectronic Circuits. 7th Oxford,2014
- BC Sedra, Adel S.. Microelectronic circuits / Adel S. Sedra, Kenneth C. Smith . - 5th ed. New York [etc.] : Oxford University Press, 2004
- BC Singh, Jasprit. Semiconductor Devices. Wiley-Blackwell. 2001
- BC Streetman, Ben G.. Solid state electronic devices / Ben G. Streetman and Sanjay Banerjee . - 5th ed. London [etc.] : Prentice-Hall International, cop. 2000
- BC Sze, Simon Min. Semiconductor devices : physics and technology / S. M. Sze . - 2nd ed. New York [etc.] : John Wiley and Sons, cop. 2002
- BC Yang, Edward S.. Microelectronic devices / Edward S. Yang . - International ed. New York : McGraw-Hill, 1988

LISTADO DE URLs:

- Sargent, R.G. (2013). Verification and validation of simulation models. Journal of Simulation, vol. 7, pp. 12-24. Artículo claro y conciso sobre las diferentes maneras de verificar y validar un modelo. [http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.642.9598&rep=rep1&type=pdf]

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- Van Zeghbrock ,B: Principles of Semiconductor Devices [http://ecee.colorado.edu/~bart/book/book/contents.htm]