29812 - Basic principles of electronics

Información del Plan Docente

Academic Year	2018/19
Subject	29812 - Basic principles of electronics
Faculty / School	110 - Escuela de Ingeniería y Arquitectura 326 - Escuela Universitaria Politécnica de Teruel
Degree	440 - Bachelor's Degree in Electronic and Automatic Engineering 444 - Bachelor's Degree in Electronic and Automatic Engineering
ECTS	6.0
Year	2
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The process of teaching and learning designed for this subject is based on the following. It will involve three main levels: lectures, practical exercises and laboratory; and a fourth complementary level: the workshops.

- In the lectures, the basic components of the electronic design will be introduced from an applied and design-oriented point of view, focused on the design of electronic systems.
- In the sessions of practical exercises, the analysis and design of systems from the basic components will be developed.
- Laboratory sessions will be conducted in small groups, where students will analyse and verify the operation of

electronic circuits.
- With respect to the workshops, additional activities will be carried out that are complementary to the subject program development.

4.2.Learning tasks

The program, offered to the students to achieve the learning goals, includes the following activities:

IN PERSON ACTIVITIES: 2.4 ECTS (60 hours)

1) Face-to-face sessions (T1): 30 hours.

Lectures of theoretical and practical content. The fundamentals and main applications of the basic components of electronic design will be presented, all of them illustrated with actual examples. Student engagement and participation will be encouraged through questions and brief discussions.

The developed contents are the following:

- Introduction to electronics. Applications: processing of information and energy. Analog, digital and power functions.
- Electronic devices classification.
- Techniques for the analysis of electronic circuits.
- Electronic devices: technology, modelling and basic circuits. Diodes, bipolar transistors, unipolar transistors, thyristors.

2) Practical exercise lessons (T2): 15 hours.

Practical exercises related to the theoretical contents will be developed.

3) Laboratory sessions (T3): 15 hours.

The student will analyse and verify the operation of electronic components and stages in the laboratory.

NOT IN PERSON ACTIVITIES: 3.6 ECTS (90 hours)

4) Study (T7): 82 hours.

Personal work and study of the student of the theoretical content, practical exercise performance and preparation of the lab sessions, etc. The ongoing work of the student will be encouraged by the homogeneous distribution throughout the semester of the different learning activities. This includes tutoring, as a direct student care, identification of learning problems, orientation in the subject, attention to exercises and assignments, etc.

5) Workshops and/or seminars (T6): 4 hours.

Activities that the student will perform alone or in groups and that the teacher will propose throughout the teaching period.

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6) Evaluation tests (T8): 4 hours.

In addition to the qualifying function, evaluation is also a learning tool with which the student checks the reached degree of understanding and assimilation.

4.3.Syllabus

0. INTRODUCTION TO ELECTRONICS

1. Introduction to the course: Electronic discipline.
2. Analog, digital and power electronics.
3. Characterization of an electronic component: functional characterization and limitations.

1. SEMICONDUCTORS CONDUCTIVITY.

1. Charge carriers.
2. Intrinsic and extrinsic semiconductors.
3. Carrier concentrations.
4. Generation and recombination processes.
5. Carrier flows: currents.
6. Semiconductor resistances: NTC, PTC, LDR.

2. DIODES: STATIC BEHAVIOUR.

1. PN-Junction.
2. The PN junction in equilibrium.
3. Static behaviour: characteristic curve.
4. Static equivalent circuit for large signals. Functional characterization.
5. Special-purpose diodes: Zener, LED, photodiode, Schottky.

3. DIODE RECTIFIER CIRCUITS AND FILTERING.

1. Rectifier operation of the diode.
   - Mains AC-DC conversion.
   - Half wave rectifier.
   - Full wave rectifier.
2. Capacitor filtering.
   - Power and power factor.

4. DIODES: DYNAMIC BEHAVIOUR.

1. Dynamic behaviour: equivalent circuit.
2. Diode switching.

5. BIPOLAR TRANSISTOR (BJT).

1. Structure, generalities and operation modes.
2. Basic characteristic curves.
3. Functional conclusions: relations between voltages and currents.
4. Operation limits.
5. Phototransistor.

6. BASIC BJT CONFIGURATIONS (1/2).

1. The transistor as voltage regulator.

2. The transistor as current regulator.
3. The transistor as a switch.
4. Thermal dependence of the current and its transcendence.
5. Voltage connection to loads.

7. BASIC BJT CONFIGURATIONS (2/2).

1. Transistor switching.
2. Switching improvement: drivers.
3. Optocoupler stages.

8. FIELD EFFECT TRANSISTORS.

1. MOSFET: structure and basic operation, characteristic curves, switching.
2. JFET: structure and basic operation, characteristic curves, operation as bilateral switch.

4.4.Course planning and calendar

Both theoretical and practical exercises classes and laboratory sessions are held according to the schedule set by the centre (available on the corresponding website).

Each teacher will inform of the particular tutoring hours.

4.5.Bibliography and recommended resources