Universidad Zaragoza

Year : 2019/20

29812 - Basic principles of electronics

Syllabus Information

Academic Year: 2019/20
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 course is based on the following. It will involve three main levels: lectures, practical exercises, and laboratory sessions.

- 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.

4.2.Learning tasks

The course includes the following topics:

ON-SITE ACTIVITIES: 2.4 ECTS (60 hours)

1) On-site 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, modeling, and basic circuits. Diodes, bipolar transistors, unipolar transistors, thyristors.

2) Practice sessions (T2): 15 hours.

Practical exercises related to the theoretical contents will be developed.

3) Laboratory sessions (T3): 15 hours.

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

AUTONOMOUS ACTIVITIES: 3.6 ECTS (90 hours)

4) Study (T7): 86 hours.

Autonomous work and study of the student of the theoretical content, practical exercises 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 direct student attention, identification of learning problems, orientation in the course, attention to exercises and assignments, etc.

5) 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

This course will address the following topics:

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 behavior: 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.
3. Capacitor filtering.
   Power and power factor.

4. DIODES: DYNAMIC BEHAVIOUR.

1. Dynamic behavior: 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 the voltage regulator.
2. The transistor as a 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

http://biblos.unizar.es/br/br_citas.php?codigo=29812&year=2019