

Academic Year/course: 2022/23

## 30302 - Circuits and systems

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 30302 - Circuits and systems

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 330 - Complementos de formación Máster/Doctorado  
581 - Bachelor's Degree in Telecommunications Technology and Services Engineering

**ECTS:** 6.0

**Year:** 581 - Bachelor's Degree in Telecommunications Technology and Services Engineering: 1  
330 - Complementos de formación Máster/Doctorado: XX

**Semester:** Second semester

**Subject Type:** 581 - Basic Education

330 - ENG/Complementos de Formación

**Module:**

## 1. General information

## 2. Learning goals

## 3. Assessment (1st and 2nd call)

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The teaching methodologies that will be applied in order to achieve the proposed learning goals are the following:

The course is taught using a marked practical approach, by applying Problem Based Learning (PBL) strategies: raising problems and looking for solutions. During this process, the students' critical spirit and self-assessment is encouraged.

Fundamentals of circuits and systems are presented and explained in participative lectures, while the laboratory sessions, seminars and assignments are more focused on the experimental perspective and the capacity to address new situations or problems. It is noteworthy that the laboratory sessions are face-to-face activities and their assessment contributes to the final grade of the course.

### 4.2. Learning tasks

The following types of activities are scheduled:

- APA1. Participative lectures, where the main course contents are presented and discussed.
- APA2. Problem-solving, where different activities/tasks are proposed related to the main contents of the course.
- APA3. Laboratory sessions, seminars and assignments, where students can put into practice the theoretical part of the course and are aware of its application to real-world telecommunications.

### 4.3. Syllabus

**The course will address the following topics:**

#### **PART 1**

**Unit 1. Basic concepts of circuits and systems.** Circuit variables: charge, current, voltage and power. Ohm's law. active

and passive circuit elements: independent sources, dependent sources, resistors, capacitors, inductors. Systems and properties.

**Unit 2. Basic laws and circuit theorems.** Concept of node, branch and loop in a circuit. Kirchhoff's laws. Source Transformations. Superposition. Thevenin's and Norton's theorems. Two-port networks: parameters.

**Unit 3. Nodal and mesh circuits analysis.** Nodal analysis. Mesh analysis.

## **PART 2**

**Unit 4. Time response of first-order circuits.** Introduction. First-order circuits. Unit-step function. Exponential Response. First-Order Circuits. Step Response. Transient Analysis. Steady-State Analysis: Phasors.

**Unit 5. Circuits in the s-domain. Network function.** Circuit elements in the s-domain. Impedance and admittance. s-domain circuit analysis. Network function: Circuit poles and zeros and relation to the natural and forced response. Sinusoidal steady-state analysis. Phasors and sinusoids. Complex power. Maximum power transfer.

## **4.4. Course planning and calendar**

The course calendar is determined by the Escuela de Ingeniería y Arquitectura calendar. In addition, the main dates of the course will be informed through the Moodle platform of the University of Zaragoza.

## **4.5. Bibliography and recommended resources**

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30302>