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|------------------|--------------------------------------|---------------|----------------|-------------------------------------|-------|
| Course Unit      | Electronics                          |               | Field of study | Electronics and Instrumentation     |       |
| Bachelor in      | Electrical and Computers Engineering |               | School         | School of Technology and Management |       |
| Academic Year    | 2023/2024                            | Year of study | 1              | Level                               | 1-1   |
| Type             | Semestral                            | Semester      | 2              | ECTS credits                        | 6.0   |
|                  |                                      | Code          |                | 9112-742-1203-00-23                 |       |
| Workload (hours) | 162                                  | Contact hours | T 15           | TP 15                               | PL 30 |
|                  |                                      | TC -          |                | S -                                 | E -   |
|                  |                                      | OT -          |                | O -                                 |       |

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Guido Szekir Berger, José Alexandre de Carvalho Gonçalves

#### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Select, implement and analyse the limiting circuits widely used and based on diodes and operational amplifiers;
2. Implement and analyse basic amplifier and commutation circuits based on transistors;
3. Integrate and apply circuits widely used in analogue signal processing: addition, subtraction, integral and differential operations; amplification and attenuation; limitation and filtering;
4. Utilize electronic equipment in the implementation, test and analysis of basic electronic circuits in the laboratory, with a good level of autonomy of practical skills;
5. Integrate, extrapolate and apply the acquired knowledge in the implementation, analysis and diagnosis of electronic circuits widely used in practice.

#### Prerequisites

Before the course unit the learner is expected to be able to:  
Analyse basic electric circuits.

#### Course contents

Fundamental analogue electronics: study of the main electronic components (diodes, transistors and operational amplifiers); implementation and analysis of electronic circuits of signal analogue conditioning (amplification, limitation, addition, subtraction and filtering); implementation of basic switching circuits; study of typical applications; and development of practical laboratorial skills.

#### Course contents (extended version)

1. Study of the main electronic components:
  - Diodes – applications in limiting and rectifier circuits;
  - Transistors – applications in basic amplifier and switching circuits;
  - Operational amplifiers – application examples.
2. Implementation and analysis of electronic circuits of signal analogue conditioning
  - Amplification.
  - Limitation
  - Addition.
  - Subtraction.
  - Filtering.
3. Implementation of basic switching circuits with transistors.
4. Development of laboratorial skills through the implementation and analysis of typical applications.

#### Recommended reading

1. Microelectronic Circuits, Adel S. Sedra, Kenneth C. Smith, 2004, Saunders College Publishing;
2. Electronic Devices - Discrete and Integrated, Stephen Fleeman, 1990, Prentice-Hall;
3. Electronics Fundamentals. Circuits, Devices and Applications, Thomas L. Floyd, 2001, Prentice-Hall;
4. Amplificadores Operacionais - Fundamentos e Aplicações, Arthur F. de Gruiter, 1988, McGRAW-HILL;
5. Operational Amplifiers and Linear Integrated Circuits, Robert F. Coughlin, Frederik F. Driscoll, 1998, Prentice-Hall.

#### Teaching and learning methods

Teaching Methods: lectures, problem-solving sessions and laboratory teaching with supervised simulation and experimental work; Learning Methods: notes from lectures; individual study and with other students to carry out works and solve problems; work in the laboratory.

#### Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
  - Laboratory Work - 30%
  - Final Written Exam - 70%

#### Language of instruction

Portuguese, with additional English support for foreign students.

#### Electronic validation

|   |   |                                   |                          |
|---|---|-----------------------------------|--------------------------|
| Guido Szekir Berger, José Alexandre de Carvalho Gonçalves | José Augusto de Almeida Pinheiro Carvalho | José Luís Sousa de Magalhaes Lima | José Carlos Rufino Amaro |
| 26-02-2024  | 26-02-2024                                | 27-02-2024                        | 02-03-2024               |